POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1930	h m	°	°	°			
Nov. 28 (Naval Observatory)	12 5	−51.5	31.0	+7.0		93	
		−33.5	49.0	+17.5		46	
		−21.5	61.0	+8.0		108	
		−9.5	73.0	+16.5		22	
		+22.0	104.5	+5.5		31	
		+23.0	105.5	−9.0		340	
		+55.5	138.0	−7.0		46	686
Nov. 29 (Naval Observatory)	11 40	−37.0	32.5	+7.0		77	
		−21.0	48.5	+19.5		31	
		−8.5	61.0	+8.0		93	
		+10.0	79.5	+14.5		77	
		+35.0	104.5	+16.0		37	
		+35.5	105.0	−9.0		324	639
Nov. 30 (Mount Wilson)	13 30	−19.0	36.4	+8.0		42	
		−1.0	54.4	+17.0		1	
		+7.0	62.4	+9.0		27	
		+25.0	80.4	+15.0		101	
		+50.0	105.4	−9.0		374	
		+51.0	106.4	+6.0	2		547
Mean daily area for November							472

PROVISIONAL RELATIVE SUN-SPOT NUMBERS FOR NOVEMBER, 1930 [1]

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

November, 1930	Relative numbers	November, 1930	Relative numbers	November, 1930	Relative numbers
1	57	11	8	21	dd 66
2	41	12	14	22	70
3	25	13	0	23	68
4	27	14	12	24	a 51
5	16	15	d 14	25	Wc 58
6	8	16		26	Eabc 76
7	8	17	26	27	72
8	9	18	d 31	28	67
9	8	19	b	29	61
10	15	20	61	30	54

Mean, 28 days=36.5.

[1] Dependent alone on observations at Zurich and its station at Arosa.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a large or average-sized center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

By L. T. SAMUELS

Free-air temperatures during November were considerably above normal at Ellendale, moderately above at Royal Center, slightly below at Broken Arrow and moderately below at Groesbeck and Due West. (See Table 1.) This is in close agreement with the distribution of surface departures shown in Chart I.

The departures of free-air relative humidities were in general, of opposite sign to those of temperature.

Free-air vapor pressures were above normal at all levels at Ellendale, Royal Center, and Broken Arrow and in the upper levels at Due West and Groesbeck.

From Table 2, it will be noted that free-air temperatures at the naval air station, Pensacola, were in close agreement with those at Groesbeck, being slightly higher at the former station. Those at San Diego were highest of all stations.

At 1,000 meters above sea level the free-air resultant winds indicated a southwesterly component over the middle Mississippi Valley and lower Lake region and northwesterly and westerly over the remainder of the country. At 3,000 meters none of the resultant directions contained an appreciable southernly component, except in the extreme Northwest. The easterly component found at 1,000 meters over Brownsville and Key West changed to westerly at 2,000 meters over Brownsville and to north-northwesterly at 3,000 meters over Key West. The monthly resultants for a representative group of stations are shown in Table 3.

A very severe sleet storm occurred at Ellendale on the 18th, 19th, and 20th. The kite record of the 18th was of unusual interest in that it showed a marked rise in temperature from the 17th to 18th between 3,000 and 3,500 meters. The increase amounted to 7° C. at the higher level and was unquestionably greater at still higher elevations beyond the limit of the flight. A significant feature of this high inversion was the fact that the air within it was saturated and 10-tenths altostratus clouds from the south-southeast prevailed. On the morning of the 18th a deep LOW (29.3 in.) was central over Colorado.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during November, 1930*

Altitude (meters) m. s. l.	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
TEMPERATURE (° C.)										
Surface	8.2	−1.5	7.7	−2.9	0.6	+2.9	10.0	−3.2	5.4	+0.7
500	8.3	−0.3	7.2	−2.4	0.7	+3.0	10.9	−1.5	4.3	+1.2
1,000	7.7	+0.3	6.0	−1.9	2.7	+4.6	9.5	−1.7	2.8	+1.2
1,500	5.7	−0.7	4.9	−1.5	2.5	+4.7	7.8	−1.8	1.5	+1.2
2,000	3.8	−0.9	3.1	−1.6	0.7	+4.5	5.9	−1.8	0.4	+1.9
2,500	1.4	−1.1	0.8	−2.1	−1.6	+4.4	2.9	−2.7	−1.9	+1.5
3,000	−0.7	−0.8	−2.0	−2.7	−4.3	+4.3	0.3	−2.9	−4.4	+1.3
4,000	−8.8	−4.0	−8.0	−3.2	−9.6	+4.7	−6.1	−3.9	−10.2	+0.3
5,000					−15.4	+4.2				
RELATIVE HUMIDITY (%)										
Surface	68	+1	74	+3	70	−8	75	+1	73	0
500	64	0	68	+2	69	−7	59	−8	70	−2
1,000	58	−1	63	+1	57	−8	51	−8	65	−2
1,500	55	+3	57	0	51	−7	43	−9	52	−7
2,000	53	+6	54	+2	50	−5	45	−1	44	−10
2,500	48	+5	48	+4	53	−1	46	+6	40	−10
3,000	45	+3	59	+18	56	+2	43	+7	40	−9
4,000	45	+10	65	+30	54	−2			36	−9
5,000					54	+4				
VAPOR PRESSURE (*mb.*)										
Surface	7.80	−0.42	8.79	−0.85	4.37	+0.13	10.34	−1.69	7.73	+1.13
500	7.47	+0.07	7.97	−0.53	4.32	+0.16	8.74	−1.79	6.89	+1.05
1,000	6.39	+0.16	6.85	−0.34	4.09	+0.53	6.81	−1.70	5.79	+0.97
1,500	5.25	+0.20	5.69	−0.06	3.60	+0.52	4.88	−1.69	4.18	+0.37
2,000	4.48	+0.56	4.77	+0.28	3.04	+0.43	4.38	−0.51	3.21	+0.17
2,500	3.47	+0.42	4.04	+0.84	2.66	+0.45	3.69	−0.11	2.49	+0.02
3,000	2.75	+0.29	4.31	+1.87	2.25	+0.44	3.09	+0.33	2.25	+0.09
4,000	1.61	+0.27	3.63	+2.51	1.47	+0.28			1.89	+0.63
5,000					0.91	+0.20				

TABLE 2—*Free-air data obtained at naval air stations during November, 1930*

Altitude (meters) m. s. l.	TEMPERATURE (° C.)		RELATIVE HUMIDITY (%)	
	Pensacola, Fla.	San Diego, Calif.	Pensacola, Fla.	San Diego, Calif.
Surface	11.3	19.1	82	81
500	10.4	17.6	76	48
1,000	9.0	16.6	72	42
2,000	6.2	10.7	61	38
3,000	2.6	5.0	46	35

TABLE 3.—*Free-air resultant winds (meters per second) based on pilot balloon observations made near 7 a. m. (E. S. T.) during November, 1930*

Altitude (meters) m.s.l.	Broken Arrow, Okla. (233 meters)		Brownsville, Tex. (12 meters)		Burlington, Vt. (132 meters)		Cheyenne, Wyo. (1,873 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (139 meters)		Havre, Mont. (762 meters)		Jacksonville, Fla. (14 meters)		Key West, Fla. (11 meters)		Los Angeles, Calif. (145 meters)		Medford, Oreg. (410 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	S 16 W	1.2	N 52 W	0.7	S 4 W	3.0	N 69 W	5.6	N 1 E	1.6	N 44 W	3.4	N 25 E	0.7	W	2.0	N 9 W	1.2	N 42 E	3.2	N 49 W	1.7	S 51 W	0.3
500	S 39 W	4.3	S 47 E	3.6	S 22 W	6.9	----------	----	N 25 E	2.6	N 46 W	3.8	N 11 W	0.4	----------	----	N 1 E	1.4	N 59 E	8.4	N 70 E	1.3	N 86 W	0.3
1,000	N 83 W	5.6	S 71 E	2.8	S 63 W	6.9	----------	----	N 24 W	2.1	N 33 W	7.5	N 64 W	3.0	S 79 W	5.8	S 62 W	1.4	N 68 E	6.0	N 72 E	1.6	S 39 E	1.6
1,500	N 62 W	5.7	S 10 W	2.6	S 63 W	8.4	----------	----	N 68 W	3.7	N 37 W	9.3	N 62 W	6.5	N 66 W	8.3	S 89 W	2.9	N 78 E	3.3	N 40 E	1.3	S 23 E	2.6
2,000	N 68 W	6.8	S 69 W	1.6	S 86 W	12.7	N 67 W	8.5	N 66 W	6.6	N 59 W	8.0	N 76 W	7.1	N 61 W	9.5	N 81 W	6.2	N 82 E	1.5	S 64 E	1.1	S 30 W	2.3
2,500	N 86 W	6.8	S 73 W	2.8	N 78 W	9.2	N 52 W	10.5	N 74 W	10.0	N 63 W	8.4	N 82 W	7.0	N 67 W	11.2	N 78 W	8.4	N 7 E	1.5	N 11 E	2.7	S 51 W	2.6
3,000	S 88 W	7.0	N 55 W	0.7	N 64 W	10.7	N 54 W	9.5	N 65 W	11.1	N 77 W	7.6	N 76 W	5.5	N 56 W	13.1	N 78 W	9.3	N 15 W	0.6	N	5.1	S 58 W	4.0
4,000	----------	----	N 50 W	2.3	----------	----	N 66 W	8.2	N 65 W	8.0	N 70 W	7.4	N 70 W	6.3	----------	----	N 77 W	11.7	N 40 W	2.4	----------	----	S 81 W	6.1
5,000	----------	----	----------	----	----------	----	N 54 W	5.7	S 83 W	7.6	----------	----	----------	----	----------	----	----------	----	N 69 W	3.7	----------	----	----------	----

Altitude (meters) m.s.l.	Memphis, Tenn. (145 meters)		Modena, Utah (1,665 meters)		New Orleans, La. (25 meters)		Omaha, Nebr. (321 meters)		Phoenix, Ariz. (356 meters)		Royal Center, Ind. (225 meters)		Salt Lake City, Utah (1,294 meters)		San Francisco, Calif. (8 meters)		Sault. Ste. Marie, Mich. (198 meters)		Seattle, Wash. (14 meters)		Spokane, Wash. (606 meters)		Washington, D. C. (10 meters)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	S 49 W	1.1	S 84 W	1.6	N 5 E	1.3	S 9 E	1.2	N 81 E	3.4	S 27 W	1.9	S 46 E	1.7	N 75 E	1.0	S 6 W	0.5	S 52 E	0.4	S 47 E	0.7	N 81 W	0.4
500	S 50 W	3.9	----------	----	N 11 E	3.9	S 35 W	4.6	N 74 E	4.1	S 61 W	6.7	----------	----	N 9 E	3.0	S 67 W	2.0	S 13 W	1.8	----------	----	W	4.0
1,000	S 79 W	6.0	----------	----	N 31 W	2.6	S 78 W	7.7	S 88 E	3.6	S 74 W	7.1	----------	----	N 10 E	3.6	N 73 W	4.8	S 26 W	6.9	S 13 E	2.7	N 88 W	7.1
1,500	S 87 W	6.0	----------	----	N 26 W	7.0	N 86 W	6.9	S 62 E	3.1	S 74 W	7.3	S 63 E	0.9	N 2 E	2.2	S 84 W	8.3	S 40 W	6.3	S 33 W	5.1	N 69 W	8.5
2,000	N 83 W	5.2	N 36 E	2.2	N 36 W	7.0	N 87 W	6.9	S 49 E	1.1	S 71 W	9.5	N 15 E	0.6	N 13 E	2.4	S 79 W	9.7	----------	----	S 57 W	7.2	N 83 W	6.6
2,500	N 51 W	7.3	N 39 E	4.3	N 18 W	5.4	S 89 W	10.4	S 66 E	1.3	N 83 W	8.0	N 22 W	1.5	N 25 E	5.2	----------	----	----------	----	S 67 W	9.8	N 75 W	6.4
3,000	----------	----	N 36 E	3.4	N 21 W	5.2	S 89 W	7.8	N 58 E	0.9	----------	----	N 24 W	3.3	N 20 E	5.4	----------	----	----------	----	S 72 W	10.2	W	7.3
4,000	----------	----	N 14 E	4.5	----------	----	N 44 W	9.0	N 28 E	2.8	----------	----	N 37 W	4.1	----------	----	----------	----	----------	----	----------	----	----------	----
5,000	----------	----	N 15 E	5.1	----------	----	----------	----	----------	----	----------	----	N 75 W	2.9	----------	----	----------	----	----------	----	----------	----	----------	----

TABLE 4.—*Observations by means of kites, captive and limited height sounding balloons during November, 1930*

	Broken Arrow, Okla.	Due West, S. C.	Ellendale, N. Dak.	Groesbeck, Tex.	Royal Center Ind.
Mean altitudes (meters) m. s. l. reached during month	2,614	2,285	3,233	2,309	2,828
Maximum altitudes (meters) m. s. l. reached and date	4,406	4,274	5,549	4,070	4,345
Number of flights made	28	29	27	17	26
Number of days on which flights were made	28	28	22	17	26

In addition to the above there were 163 scheduled pilot balloon observations made daily at 56 Weather Bureau stations in the United States.

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By M. C. BENNETT

GENERAL SUMMARY

The first decade of November was warm for the season throughout much of the western section of the country, but it was generally cool in the Central and Eastern States. Thereafter, unusually high temperatures prevailed generally in the East until near the end of the month, when they were abnormally low, with freezing weather as far south as northern Florida. As a whole, the month averaged warmer than normal from the northern and central Great Plains eastward to the Atlantic Ocean, but in the South, the more eastern States, and the Ohio Valley, it was near the normal. Decidedly cold weather for the season prevailed in much of the far Northwest, especially in the northern and central Great Basin, while it was decidedly above normal in the south Pacific area.

For the month as a whole, precipitation substantially above normal was received over an area from southwest Virginia southwesterly to the Gulf, with some portions of the southern sections receiving from two to four times the normal amount. Heavy falls were received also in the central and northern Great Plains, the central Rocky Mountains, the Great Basin, and southern California. On the other hand, much of the far Northwest, the northern Rocky Mountain districts, and parts of the Ohio Valley and the Middle Atlantic States received less than half the average for November. Light snow fell as far south as Georgia, and some heavy falls were received in the upper Lake region and much of the Northwest.

TEMPERATURE

The very first days were abnormally cool practically everywhere east of the Rocky Mountain divide, and the first 10 days of November, as a whole, were cooler than normal in the eastern half of the country, especially in the lower Mississippi Valley and to the eastward, but were mild in the West.

The middle decade of the month and the first half of the final decade were comparatively warm east of the Rocky Mountains, particularly in the Lake region and the upper Mississippi Valley, but were cool west of the Rockies, save on the California coast. The final half of the last decade was cold from the Plains region eastward and in most of the Plateau region; but was milder than normal in the northern Rocky Mountain States, near the Mexican border, and near the Pacific coast.